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Regional Science Matters

Studies Dedicated to Walter Isard

Springer

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Integration, Contagion, and Income Distribution

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Abstract

The 2008/2009 global financial crisis and the unprecedented policy response in advanced economies have a worldwide impact. The episode also led many to question the standard framework of economic thinking on regional integration, financial liberalization and their repercussions on income disparity. The paper argues that one needs to take a balanced view on integration—not just the benefits but also the risks. If regional integration leads to greater inequality, the expected growth and prospect of improved welfare can be diminished. Utilizing a general equilibrium framework, it is also shown how financial liberalization and the surge of capital inflows can produce not only financial instability but also worsening income disparity. By combining model-based results and theory-based ranking applied to the Asian case, and considering the benefits, opportunities, costs and risks of alternative policies, it is revealed that imposing levy on bank-led flows can be used to reduce instability and inequality. This type of macro-prudential policy reflects a departure from the 'First Best' to the 'Second Best' approach of liberalization, where the frictionless outcome of the former is seriously questioned.

9.1 Introduction

Whether we understand it or not, what began the latter part of last decade is changing global economic thinking. The subprime crisis, the resultant collapse of Lehman Brothers in the United States (US), and the subsequent Eurozone crisis humbled economists and regional scientists. Given that these two are the world's biggest, most advanced economies, it is not difficult to imagine the extent of

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repercussions on the rest of the world not only in terms of macroeconomic impact but also on income inequality. The crisis also put the standard framework of economic thinking on the spot, where the validity of some fundamental concepts is now questioned. Three stand out: (1) the virtue of integration; (2) the risks of financial liberalization; and (3) how finance affects income inequality.

To deal with the first, I revisit the concept of regional integration by taking a more balanced view—not just the benefits but also the risks of integration. On the second and third, I offer a model to show the mechanism how seemingly unrelated financial phenomena are in fact closely interlinked with income inequality. I use the case of capital flows intermediated by banks (bank-led flows) in emerging Asia, given their importance to a region where integration has been accelerating since the late 1990s. Capital inflows helped the financial sector grow, but it can also increase the risk of instability and worsen the income inequality.

9.2   Regional Integration Revisited

9.2.1   Benefits and Opportunities of Integration

Proposition 1 Regional integration expands markets and input sources, better allocating resources across the region and accelerating economic growth.

Regional economic integration is used by countries to achieve national interests—only this time in concert with others. It expands national markets to the region. Like globalization, it can be thought of as an alternative to international embeddedness—or how one relates to the rest of the world. But unlike globalization, regional integration is geographical, and in some cases political.[1] It is institutionally stronger than globalization, as rules tend to be tighter and peer pressure can be more intense.

Expanding markets and input sources beyond national boundaries is one of the most compelling arguments for integration. With an expanded market for goods and services, for both output and inputs, higher economic growth and improved welfare can be expected (Fig. 9.1). Integration helps more efficient resource allocation across the region (or globally) in line with the principle of comparative advantage. If, as a result, productivity growth is enhanced, regional integration can accelerate economic growth and increase employment.

Asia's strong economic performance and resilience despite the recent global financial crisis was largely supported by the region's openness. The drop in external demand from Europe and the US, the 'traditional' market for Asia's final goods

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[1] When integration is promoted for political reasons and to build trust, the political windfall that follows can also lead to significant economic benefits.
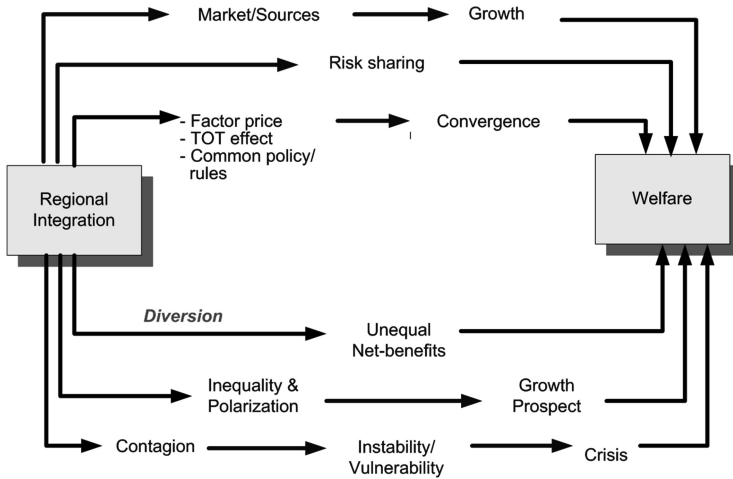
Fig. 9.1 Regional integration—a balanced view. *Source:* Author's construction

exports, has been substituted by increased exports to other Asian countries, as well as to emerging markets outside Asia (Fig. 9.2).[2]

Growing and deepening value chains play a major role in intraregional trade. While the region continues to rely on the global market, the shift reflects a trend of growing regional integration, a process that began in earnest following the 1997/ 1998 Asian financial crisis. Other factors may have played a role, but this trend certainly helped Asia maintain market expansion—even when world trade fell sharply in 2009.

Proposition 2 Regional integration can reduce income inequality between countries.

It is important to realize that integration may not generate the same benefits for all. Whether in trade, finance, or infrastructure, integration benefits some more than others. And when one measures its effects in the broader sense—beyond the original purpose of integrating—some countries can even lose.[3] So how the benefits of regional integration are distributed matters a great deal.

Most studies based on Europe's integration indicate the process coincides with a substantial decrease in income inequality between countries (Leonardi 1995;

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[2] Asia's export share to other emerging markets outside Asia, particularly exports to the Middle East, grew fast, followed by Africa and Latin America. As a result, the export share to these regions increased from 8.4 % in January 2007 to 11.3 % in August 2012.

[3] Venables (2009) argued that the gains from integration are unevenly distributed. Some countries will lose from integration. In particular, the effects of preferential liberalization in regional integration will only benefit resource-poor countries, whereas non-preferential liberalization tends to benefit only resource-rich countries.

¹Includes Brunei Darussalam; Cambodia; People's Republic of China; Hong Kong, China; Indonesia; Republic of Korea; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; and Viet Nam.
²Includes US and eurozone.
Source: Processed from *Direction of Trade Statistics*, International Monetary Fund.
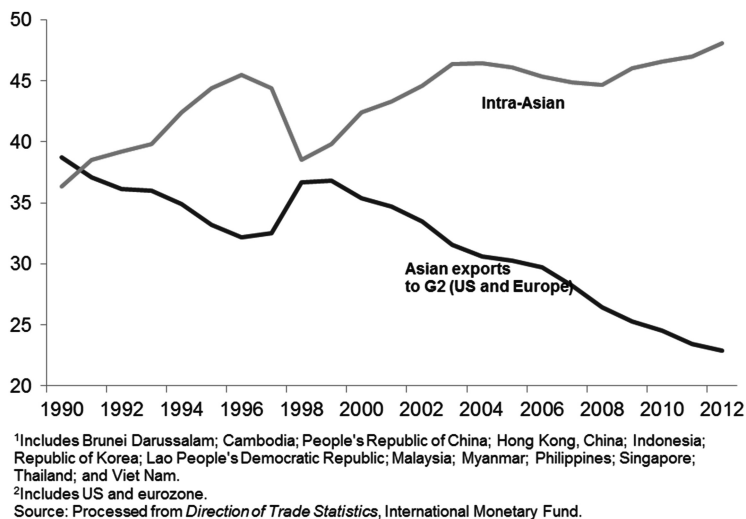
Fig. 9.2 Increasing Intra-Asian exports

Armstrong 1995).[4] While economic factors are important, it is political integration that appears to drive convergence. Institutional forces outweigh market forces in drawing national economies closer together (Beckfield 2009). Economic arguments show freer trade and factor mobility from integration allow less-developed members to grow faster than more-developed ones. Factor price equalization further supports the convergence hypothesis (Stolper and Samuelson 1941). In a two-country resource-rich/resource-poor model, lowering tariffs has a negative effect on real wages in the resource-rich country (most gains accrue to resource rent), while the resource-poor country benefits through terms-of-trade. This also supports the convergence hypothesis.

However, an institutionalist economic explanation emphasizes more the formal structure and role actors play in integration initiatives. It suggests that as economic actors follow common rules in a more integrated system, and markets increase in size and complexity, convergence will likely result. It also stresses the importance of politically established institutions. Thus, to analyze convergence, political relations matter more than regional markets or economic development. Convergence can come from the diffusion of common development policies and the diffusion of common rules and market regulations.

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[4] Evidence from Cross-Sectional Analysis of the Regional Growth Process within the European Union is shown in Armstrong (1995); and Ben-David (2001). Some, however, found a pattern of divergence; see Slaughter (2001); Arestis and Paliginis (1995). Part of the explanation rests on the interpretation of σ- and β-convergence (Martin 1996), where σ-convergence is a decrease in GDP dispersion, hence showing how the distribution of income evolves, and β-convergence points to a negative relationship between growth and initial level of GDP.

$$Gini = \frac{-(n+1)}{n} + \frac{2}{n^2 \mu_x} \sum_{i=1}^{n} i x_i$$

Fig. 9.3 Gini coefficient index

In Asia's case, convergence is also detected; inequality between countries has been declining (Fig. 9.3). Whether this is due to regional integration or other factors—or both—remains to be studied. Regardless, the theoretical arguments above are likely part of the reason. This has an important meaning since the goal of integration is fundamentally different than in Europe. Regional integration in Asia has not been based on a singular fixed set of beliefs. It is more market-driven, facilitated by unilateral investment and trade-enabling policies that change in different times (flexible), and with awareness of different level of development in different countries. While achieving "United States of Europe" is the goal in the European integration, the implicit goal of Asian integration is to manage the diversity.[5] The deliberate act of forging a common platform including forming regional institutions and inter-governmental organizations after the 1997/1998 Asian Financial Crisis does not negate such a goal.

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[5] Recent comment by Vice President of the European Commission, Vivane Reding, who is the longest serving Brussels commissioner, is simply a re-confirmation. She called for the EU (European Union) to become a "United States of Europe as the best weapon against the Euro-skeptics." She further argued that "We need to build a United States of Europe with the Commission as government and two chambers. . . . .," implying that individual sovereignty would be a thing of the past.
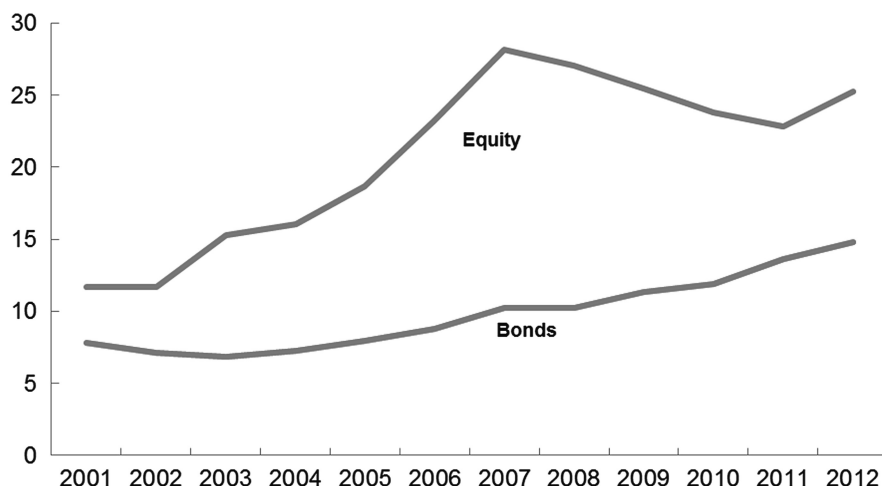
Fig. 9.4 Intra-Asian portfolio investment

Proposition 3 Risk sharing is another possible benefit of integration; unfortunately, there is little empirical evidence that it happens.

Intuitively, risk sharing through integration makes sense. But many empirical studies show integration has a limited effect on the degree of risk sharing. Since the work of Backus et al. (1992), there have been several studies examining the presence of full risk sharing using cross-country income and consumption correlations. Most of them found that perfect risk sharing does not happen. Asia is no exception. Given an idiosyncratic shock, risk sharing was neither strong, nor did it improve.

What causes this mismatch? Based on numerous cross-country studies, it could stem from several factors, ranging from using domestic equity markets as a major source of finance (French and Poterba 1991), to time horizon and measurement errors (Canova and Ravn 1996), to consumption endowment uncertainty (Obstfeld 1994; Mendoza 1995), to the limited size of capital flows and higher sovereign default (Bai and Zhang 2005).

The effect of financial integration on economic growth has been well documented—more so than the effect of integration on risk sharing (Levine 2001). Theoretically, the consumption growth rate in integrating countries will be cross-sectionally independent of idiosyncratic variables as financial integration increases (Cochrane 1991). The key factor is greater insurance. If inter-regional or international capital markets are well integrated, countries can insure against

idiosyncratic shocks. Individuals will invest more in high-risk and high-return assets if the risk can be shared or diversified (Obstfeld 1994).

Asia's financial integration is increasing, especially since the 2008/2009 global financial crisis, but remains limited (Fig 9.4). Using several welfare measures and alternative risk sharing scenarios, Azis (2007) concludes that ". . ..while the level of East Asian financial integration may have increased, its benefits in terms of consumption and investment risk sharing have been limited. Even the advantage of having greater resilience to [an] external shock, that could be potentially reaped from greater synchronization of business cycles, has not been evident." In an IMF Working Paper, Borensztein and Loungani (2011) also conclude that intraregional risk sharing in Asia is low. For a given degree of contagion risk exposure, the US stands out as the one that reaps the most benefit from sharing risks with Asia. The study suggests that the region should work toward increasing risk sharing without exposing countries to greater contagion risks: "pursuing these regional policy avenues should receive a priority over a push for further overall financial integration whose welfare effect may be ambiguous."

All in all, while the level of Asia's financial integration may have increased, its benefits in terms of consumption and investment risk sharing have been limited. Although the concept of integration-driven risk sharing is ideal and conceptually sound,[6] the impact of regional integration must be predicated not on an ideal world, but on the world as it is.

9.2.2 Costs and Risks of Integration

When regional initiatives are launched to strengthen integration—for example, those that boost infrastructure connectivity, risk sharing, and market liberalization—we hear more of its benefits. Far less is heard on the risks of integration.

Proposition 4 The cascading effect of the Eurozone crisis was a vivid reminder of the contagion risk of highly integrated systems.

The main argument against excessive integration is that it exacerbates contagion in times of crisis. Examples abound of financial crises rapidly spreading from one country to another, especially when integration is deeper due to either geographical proximity or a regional arrangement.

While a shock may originate in the financial sector of one country, it can rapidly infect others across a region—affecting entire economies and damaging people's welfare. For Asia, the damage caused by the 1997/1998 Asian financial crisis is a

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[6] Under certain circumstances, however, Stiglitz (2010) shows that risk sharing can be unfavorable. While the more integrated the regional economy the better risks can be dispersed, risk sharing can lower expected utility when the standard assumption of convexity and concave utility function does not hold. In particular, this is true when technologies are not convex. Following this dictum, and given the fact that information, externalities, and learning processes may give rise to a natural set of non-convexities, the intuition that integration should be desirable is not always accurate.

powerful reminder of the danger of contagion. An idiosyncratic shock, an exchange rate collapse followed by widespread financial crisis occurring in Thailand, leaped across boundaries, devastating economies of Indonesia, Malaysia, and the Republic of Korea. And yet the scale of integration in Asia at the time was more limited than now, despite some policy convergence. One can only imagine how much worse the crisis would have been had intra-Asian cross-border financial holdings had been larger than they were.

In adopting a single currency, the risks of integration cannot be overemphasized. Many studies prior to the formation of euro emphasized the benefits and opportunities of a single currency. This could be true for Asia as well. But when critical preconditions are not in place, and a desirable sequence is not followed (for example, political before economic integration), forcing a single currency on a group of countries can be risky—and costly as in the Eurozone today. Taking account of these risks and costs—some of which are intangible—a single currency remains a long-term prospect for Asia. Even after running some sensitivity tests, the outcome is the same (Azis 2009). Clearly, it could be counterproductive to focus on potential benefits while neglecting the risks and costs of a single currency in promoting regional integration.

Proposition 5 Trade diversion is another potential risk from regional integration, potentially detrimental to welfare.

Trade diversion is a classic integration risk debated among academics and policy makers alike.[7] It often occurs under free trade agreements (FTAs), when reduced tariffs give a less efficient producer under the FTA comparative advantage over a more efficient competitor outside. In Asia, the South Asia Free Trade Area is a notable example. Given relatively high levels of protection in the region, many predicted the risk of trade-diversion would be high (Baysan et al. 2006). This could be minimized, however, if regional integration was driven by unilateral and multilateral liberalization.[8] When geographical agglomeration effects are also at work, regional integration produces unequal net benefits; development takes place in a few rather than in all.

Proposition 6 Integration tends to increase inequality within countries

In a report by the Commission on the Measurement of Economic Performance and Social Progress, Stiglitz et al. (2010) viewed inequalities as the first cross-cutting challenge for quality-of-life indicators. They argued that inequalities should be assessed comprehensively by examining differences in the quality of life—across people, groups, and generations.

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[7] A customs union is a form of regional integration likely to cause the largest trade diversion, where effects are distributed unequally.

[8] The trade-off between trade creation and trade diversion is often used to back north-south FTAs. South-south FTAs are more prone to trade diversion.

Unlike the relation between regional integration and income inequality *between* member countries, the relation between regional integration and income inequality *within* countries is based on the idea that market competition and the labor/capital balance of power is a key determinant of income inequality. Unfortunately, there are few empirical studies on this; and most relating to European integration. They argue that economic integration tends to create a larger labor market and increase wage competition between workers (Western 1997). With workers exposed to competition beyond national boundaries, their bargaining power weakens—either through unions losing influence or by other means. In this case, further integration is expected to increase internal inequality (Alderson and Nielsen 2002).

So what is the difference between the impact of globalization and regional integration, as both give rise to increased market competition? Labor markets expand more readily and labor is more competitive within regions than between regions. Consequently, firms can more easily exercise control over subsidiaries within than between regions. Also, political institutions are more similar within than between regions. So one can hypothesize that regional integration would likely reduce the power of labor unions, and thus have a more pronounced effect on income inequality.

In some cases, more developed institutions (like in Western Europe) can insulate workers from the pressures of international competition (Cameron 1978). Strong welfare states with generous unemployment benefits and training programs can help stabilize the national economy against the vicissitudes of international markets, such that worsening inequality can be averted when regional integration increases.

Most empirical evidence on this is based on Europe's integration. The welfare state shapes stratification directly through income transfers, and can reduce inequality and poverty. But European integration also limited individual government intervention. In addition, there was some retrenchment of Western European welfare states through spending limits imposed by the "convergence criteria" of the 1992 Maastricht treaty (Brady 2003). Thus, more limited national autonomy due to regional integration contributes to the shrinking of the welfare state, one consequence of which is greater income inequality.

In Asia, inequality within most countries has been rising (ADB 2012) alongside economic integration. This does not imply causality, however. With limited integration compared with Europe, it is hard to positively link the two. Deepening regional cooperation to remove barriers to trade and finance, and to further deregulate markets ("negative integration") can have a stronger impact than those from regulations designed to correct market failures ("positive integration"). This has happened in Europe,[9] and there is no reason it cannot happen in Asia as well. When it does, inequality and polarization within countries may worsen.

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[9] The convergence effect of regionalization on between-country income inequality in Europe outweighs the polarizing effect of regionalization on within-country inequality, such that the net total income inequality has declined. In other words, regional integration has a positive net effect on reducing total income inequality (Scharpf 1997).

Unlike in the past, it is now widely acknowledged that income and wealth inequality clearly inhibits future growth [see, among others, Nissanke and Thorbecke (2010)]. Inequality is often associated with inadequate property rights, lowering investment. This is common knowledge. But the uncertainty created by the diffusion of political and social instability caused by inequality also tends to raise rent-seeking and dampens investment. All this challenges the standard argument for Kuznets' U-hypothesis.[10] Thus, if regional integration does lead to greater inequality within a country, growth and the prospect of improved welfare is diminished.

9.2.3   Welfare as the Goal and the Importance of Unilateral Policies

Like any policy and strategy, the goal of integration must be an improvement in welfare and quality-of-life—especially for the largest segment of society. Indeed, welfare measures must go beyond just consumption-based utility. Take trade integration. The volume and composition of trade are standard indicators in evaluating whether or not an FTA advances regional integration. But this is just part of the story. How those indicators change will either improve or weaken some socio-economic indicators matters as well. While these may not be on the FTA agenda, they must be taken into account from the perspective of overall development. Ignoring them could lead to misguided policies.

The policy response to a crisis caused by integration-driven contagion can damage welfare, especially when governments are belt-tightening. According to one Organisation for Economic Co-operation and Development (OECD) report, some 20 million jobs in both developed and developing countries disappeared since the 2008/2009 global financial crisis and 21 million jobs must be generated in G20 countries just to match the pre-crisis employment rate.[11] The report also says this is impossible in the near term. If anything, there is a risk the unemployment rate could increase. In a crisis, a crippled financial sector is bad enough; but nothing is worse than the true crisis costs to welfare when speaking about the risk of integration.

The environmental impact of a contagion-driven crisis poses another serious welfare risk. While a crisis can reduce pollution and resource consumption through reduced economic activity, a weakened economy also tends to lower environmental priorities.

While collective regional policies have their merit, unilateral policies can benefit both individual countries and the region. It may be true that some collective regional policies are superior to unilateral national policies. But that does not

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[10] Inequality can also affect poverty by way of determining the growth-poverty elasticity. Added by the well-known effect of growth on poverty, a triangular relation between growth, inequality, and poverty is established [see (Bourguignon 2004)].

[11] OECD and International Labour Organization (ILO) 2012. Joint statement by ILO Director-General Juan Somavia and OECD Secretary-General Angel Gurría on the occasion of the G20 Labour and Employment Ministers Meeting. Guadalajara, Mexico, 17 May.

mean unilateral policies cannot, in fact, do the job better. The East Asia Miracle of the 1980s and early 1990s is testament to the value of unilateral liberalization. To say that without integration something bad will happen is farfetched. To argue the entire region will only benefit by joining an integration initiative or agreeing on some regional agenda is equally erroneous. Even without the risks of integration discussed earlier, this is the wrong way to think.

Countries commit to a regional agenda because it is to their national advantage. It expands opportunities, and allows them to allocate their own resources more efficiently. If they fail to see this and decide not to participate, nothing disastrous will happen. This is of course very different from a global commons like climate change.

If unilateral policies improve a country's economic performance, it is not difficult to imagine some positive spillover effects on the regional economy. In trade and financial integration, for example, if countries adopt policies that are good for themselves even without signing up for a regional initiative, their economic growth could become more robust and stable, which by itself also helps the region.

Thus, national policies are key. But they are also important in maintaining the integrity of those domestic institutions required for effective regional initiatives. Even in today's more globalized world, nations remain dominant, and democratic deliberation is largely organized around them. Each country has the right to create and protect its own regulations and institutions. For regional integration to work, there must be sufficient national or domestic policy space to maintain the integrity of domestic institutions.[12] Policy space, when filled in with the right measures, can advance the regional economy. The key principle is clarity and transparency—that the unilateral policy and national deliberation are based on facts and evidence for improving welfare. The cooperation agenda for regional integration can then focus on the rules and monitoring that ensure more effective implementation, while minimizing negative spillovers (as a safeguard). This approach can also improve the quality of national deliberations, making them more effective in boosting welfare.

9.3   Integration-Driven Capital Flows and Income Inequality

9.3.1   Liberalization and Capital Flows in Post-GFC

Financial sector liberalization (FSL) has been widely promoted as a way to better allocate capital and widens opportunities for savers and investors. It also creates an environment conducive to financial innovation. Some argue that FSL helps build discipline among policy makers in securing macroeconomic stability.

This has been the predominant thinking until recently. One of its most important—yet controversial—components is capital account liberalization

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[12] A similar principle can also be applied to the concept of globalization; see Rodrik (2011).

(KAL). Capital flows resulting from KAL are channeled through domestic intermediaries—either by banks or firms—allowing greater competition and thus more efficiency. Indeed, countries adopting KAL often see a sudden jump in economic growth as they move away from financial repression. Yet, many of them, developing and developed countries alike, subsequently face instability, with some falling into financial crisis.[13]

Most analysts essentially defended KAL by citing the lack of preconditions for liberalization to explain why crises emerge. They blamed institutional factors such as corruption, weak enforcement, and limited understanding about how a liberalized financial sector operates. Policy recommendations thus centered on fixing those institutional factors, never questioning the virtue of KAL itself. Then came the 2007/2008 shock in the US, followed by the Eurozone crisis. Institutional factors in both economies were supposedly strong, well above those in many emerging markets. Obviously, the early analytical findings went out the window.

Only recently have analysts and scholars admitted early preaching on FSL and KAL was flawed [see, for example, CIEPR (2012)]. They now admit that the "First Best" approach of financial liberalization—where frictionless outcomes are emphasized—is faulty and should be replaced by a "Second-Best" approach in which financial regulation is given far greater importance, and where capital controls are no longer taboo. After decades of preaching the virtues of cross-border capital flows, the IMF finally admitted that some restrictions on capital flows can help protect an economy from financial turmoil. Central to the analysis is the need to maintain financial stability and macroprudential policy (IMF 2012).

The post-crisis low interest rate policy in advanced economies led to massive capital flows, most of which wound up in emerging markets, threatening their financial stability.[14] The resulting exchange rate pressure forced frequent market intervention to maintain trade competitiveness. But the problem does not end here. New financial vulnerability was created through bank-led inflows.

With additional funds flowing in from inexpensive sources (non-core or non-deposits), banks were more willing to take risks. Without foreign exchange market intervention, inflow-induced currency appreciation bolsters the balance-sheet of borrowers. And if used to augment bank loans, they can stimulate the economy to offset the fall in exports.[15] The problem arises when deleveraging or a

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[13] In the 1990s alone, financial crisis struck Europe (1992/1993), Mexico/Latin America (1994), Asia (1997), Eastern Europe and Russia (1998). The recent global financial crisis began in the US and Europe. Crisis contagion has also become less regional and more global. Technology and information enable financial spillovers by reducing structural distance.

[14] Most analysis suggests the easy money policy in advanced economies was less effective than originally thought. The policy not only failed to strengthen recovery in the US and other advanced economies, but also provoked global monetary instability through capital flows, including those led by "carry traders," who exploit interest rate differentials across countries. See Mckinnon (2012).

[15] The amplified effect of cross-border flows on the supply of credit due to the changing risk behavior of banks is shown in Valentina and Shin (2012).
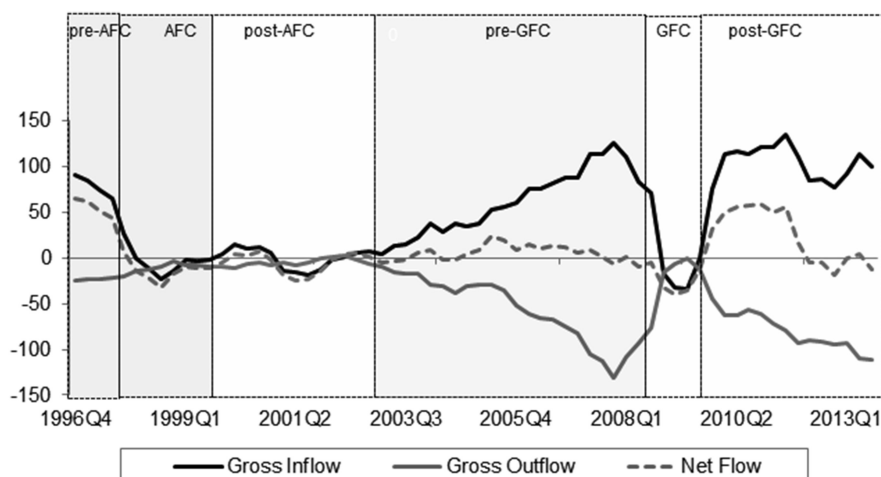
Fig. 9.5 Capital Inflows and Outflows. *Note*: Based on a 4-quarter moving sum. For inflows, refers to bank flows from other investments in the liabilities side (assigned a positive value); for outflows, in the asset side (assigned a negative value). *Source*: Processed from *Balance of Payments Statistics (both BPM5 and BPM6)*, International Monetary Fund

change in investor sentiment, for example, reverses the direction of capital flows. Loans can be disrupted, and the economy suffers a credit crunch. This occurred recently when European banks deleveraged by bringing back funds to strengthen their capital position.[16] On the other hand, a rising share in non-core liabilities can also alter bank behavior toward more risk-taking—for example by investing in securities and other risky financial assets. Indeed, data show this has already happened in some countries. Either way, increased bank-led inflows creates greater vulnerability. Only when recipient banks prudently manage and use new funds will the overall outcome be favorable.

The trend of gross capital flows in selected emerging Asian economies point to one common feature: the size and volatility of flows have increased since 2007/2008, more than that prior to the 1997/1998 Asian financial crisis (Figs. 9.5 and 9.6). While rising capital flows can be beneficial to recipient countries, their volatility and procyclicality can increase financial risks and imbalances.

Not all flows pose the same risks. It is useful to break them down into categories: (1) "equities" flows consisting of direct investment and equity portfolios; (2) "debt" flows comprising debt securities and others including derivatives; and (3) "bank"

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[16] For example, in the Republic of Korea, each 1 % decline in external funding due to European bank deleveraging following the global financial crisis led to a 0.01 % decline in domestic credit by domestic banks [see Jain-Chandra et al. (2013)]. This occurred despite the country's relatively healthy foreign reserves, government efforts to provide foreign currency liquidity through bilateral and multilateral currency swap arrangements, and macroprudential measures that lowered domestic banks' reliance on short-term wholesale funding.
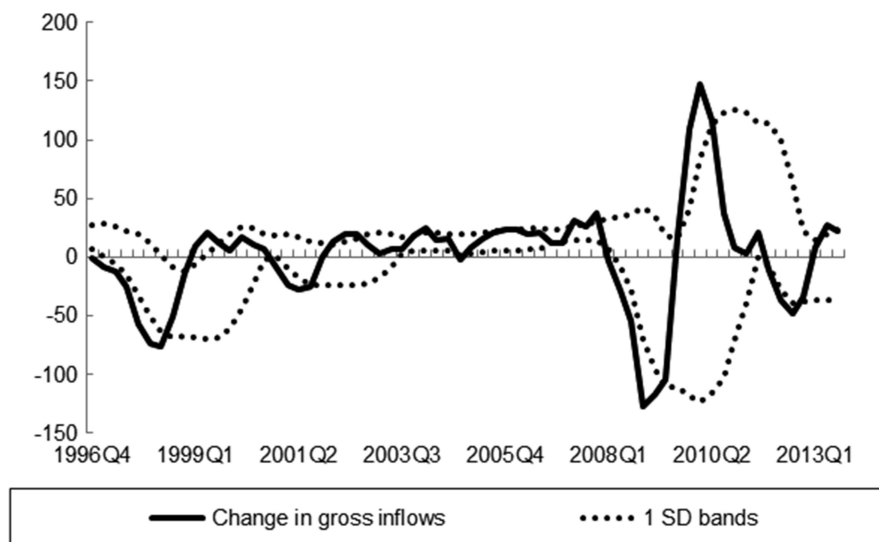
Fig. 9.6 Growth of gross inflows. *Source*: Author's construction based on the sources in Fig. 9.5

flows.[17] Inflows are equities-led, debt-led, and bank-led if the increase is mainly through equities, debt, and banks, respectively.

To better understand how each fluctuates, inflows are classified as "surges" if there is a sharp increase, and "stops" for a sharp decrease. For gross outflows, the terms "flight" and "retrenchment" are used. While "flight" refers to investors moving large amounts of capital abroad, "retrenchment" occurs when domestic investors liquidate foreign investments. Based on a one-standard deviation of the change in the mean capital flows as the limit (for example, in the case of inflows it is shown by dash lines in Fig. 9.6) beyond which they are labeled according to the above classifications, the following episodes are observed:

Surge Episodes
Equity-led: 2009Q4–2010Q1
Debt-led (excl. banking flows): 2002Q1–Q3; 2007Q2; 2007Q4
Bank-led: 1999Q1–Q3; 2004Q1; 2009Q3; 2010Q2; 2012Q4

Stop Episodes
Equity-led: 2000Q4; 2004Q4; 2006Q4–2007Q1; 2008Q1–Q3
Debt-led (excl. banking flows): 1997Q1–Q3; 2001Q1–Q3
Bank-led: 1996Q4; 1997Q4–1998Q2; 2008Q4–2009Q1; 2011Q3–2012Q1

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[17] See Forbes and Warnock (2012). However, unlike their analysis, I distinguish "debt" from "bank" because banks are more prone to deleveraging and procyclicality, thus having more direct impact on the real sector.

Flight Episodes
Equity-led: 2007Q2–Q4
Debt-led (excl. banking flows): 1999Q2, 2005Q4; 2009Q4–2010Q2
Bank-led: 1999Q2–Q3; 2002Q4–2003Q2; 2004Q3; 2006Q1–Q2

Retrenchment Episodes
Debt-led (excl. banking flows): 1998Q1–Q2; 2008Q1–Q2; 2012Q2
Bank-led: 1996Q4–1997Q1;   1998Q3–Q4;   2002Q1–Q2;   2004Q4–2005Q2;
    2008Q3–2009Q1; 2012Q3

Thus, the rise in capital flow volatility has not been uniform; debt and bank-led flows occurring most frequently. This poses challenges for financial stability. Yet, as long as ultra-easy monetary policy continues in advanced economies, capital flows are unstoppable and the threat to financial vulnerability remains. How this affects welfare, particularly when income inequality is measured, is examined next.

9.4 Financial Development and Income Inequality: A Model Framework

9.4.1 Model Framework

The links between financial development and income inequality is depicted in Fig. 9.7; the left part represents the dynamics in goods and factor markets (real sector) including exports and imports, with the right side the workings of financial markets. How the two interconnect determines the nature of the link between financial sector development and income inequality.

The real sector establishes the income generation from output production (X), with a portion covering the domestic market (D) and exports (E). Together with imports (M), those sold in the domestic market generate the total supply of goods and services (Q). In both allocations, the substitution is imperfect (not cost-less).[18] The process that generates output production (X) follows a standard input-output framework, where value added (VA) and intermediate inputs (INTM) jointly determines the level of output production (X). Expanding production networks and supply chains—where the location of production is different from the country where the intermediate inputs (INTM) are produced—suggests the need to distinguish between imported intermediate inputs (FINTM) and domestically produced intermediate inputs (DINTM). This distinction is important particularly for trade

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[18] In a standard computable general equilibrium (CGE) model, for example, the allocation between the domestic market (D) and imports (M) follows Armington's constant elasticity of substitution (CES), while the allocation between domestic market (D) and exports (E) follows a constant elasticity of transformation (CET).
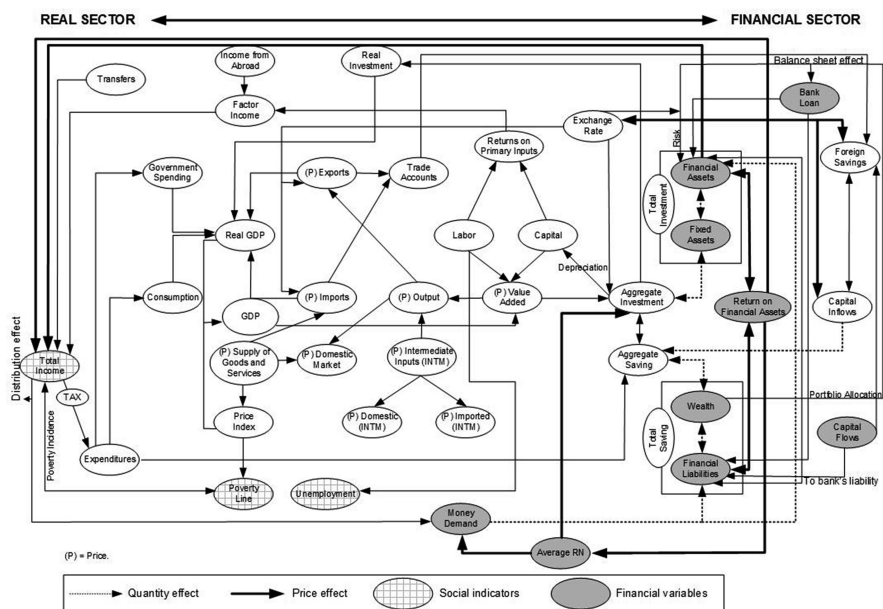
Fig. 9.7 Model framework—real-financial sector and income distribution. *Source*: Azis & Yarcia (2014) and Min (2014)

analysis in many emerging market economies where the import-content of many export products is large.[19]

The income generation is derived from the value added (VA), where returns on primary inputs of labor (L) and capital (K) are denoted by WF. In turn, these returns (WF) generate factor incomes (YF) including those from abroad (YFROW). However, total income (INC) consists of more than just factor income; it also includes transfers between agents/institutions (ITRAN). Tax payments that subtract and subsidies that add income are examples of these transfers, where size depends on the prevailing fiscal policy. Thus, income of different agents, including households, is influenced by both the level of economic activity and this non-factor income.[20] The way subsidies are allocated can have a significant impact on actual household income; typically, most subsidies go to low-income households.

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[19] The dynamics of the use of imported inputs to produce exported goods, known as vertical specialization (VS), is analyzed in Hummels et al. (2001). Amador and Cabral (2009) show that vertical specialization (VS) in high-tech products has increased dramatically since the 1980s, especially in emerging Asia. Some even label it a new paradigm in the organization of world production, representing an important element of international trade.

[20] The effect of income level on macro variables works through the expenditure side. Together with government expenditure (GD) and net exports (E-M), real consumption (CD) reflects the size of agents' expenditure (EXP) out of their disposable income (YCON). The latter is determined by the income level (INC).

Yet, these two sources are still incomplete. The actual income received by rich and urban-based households holding financial assets can be well above income accrued by those who do not hold financial assets. With financial sector liberalization (FSL) and capital account liberalization (KAL), the former are far better able to reap benefits from a growing financial sector. During the 'bubble' period following capital inflows (FSAV), they benefit from the increased value of their financial assets (FIN ASSETS) as well as the income stream generated from those assets (RN), regardless of what is happening in the real economy. In many cases, this portion is larger than that generated from factor income. To the extent the financial sector often grows much faster than the real sector during a boom, the impact on income distribution can be predicted—the rich earn far more than the poor, and urban household income grows faster than rural income, both exacerbating income inequality.

After the global financial crisis, increased bank-led flows (see again Fig. 9.5) can be charted beginning with capital flows (CFLOW) in the bottom right of Fig. 9.7. Together with loans (BANKLOAN), these flows directly augment banks' financial liabilities (FIN LIABS).[21] This alters the rate of return on financial assets (RN) and financial returns received by asset holders (RN and INC are linked). Financial assets (RN) also have a two-way relationship with the size and composition of different agents' assets. Fixed assets (FIXAS) will be used directly for real sector investment (INVEST), such as in buildings, machinery, etc., while the rest—including financial assets (FIN ASSETS)—may move indirectly via financial markets, as for example, funds from equity issuance are used for business investment. Along with government spending (GD), consumption expenditure (EXP or CD), exports (E), and imports (M), this investment (ID) in real terms generates gross domestic product (RGDP).[22]

Increased capital flows (CFLOW) [captured through foreign savings SAV(fr)] also have macro-financial impacts: pressuring the currency via the exchange rate (EXR) to appreciate. The resulting trade account (TA) may thus worsen due to falling exports (E) and increased imports (M). In reality, however, almost all emerging market economies with large capital inflows respond by imposing some sort of capital controls—either directly (through taxes or levies for example) or indirectly (sterilized market intervention). This explains why net-exports in some countries continue to grow despite increased capital inflows. When net-exports shrink, the growth of consumption (CD) and investment (ID) can also offset the decline.

The resulting higher real gross domestic product (RGDP) fuels further financial sector growth either from strong fundamentals or simply market expectations. This

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[21] Note that lending (BANKLOAN) is not only determined by the size of a bank's available funds, but also by changes in net worth and external finance premia of both borrowers and lenders; this "credit channel" hypothesis was elaborated in Bernanke et al. (1996), Adrian and Shin (2009), Stiglitz and Greenwald (2003), and Stiglitz (2001).

[22] Other financial variables can also affect aggregate economic activity by way of the money market.

further enhances rich household income along with savings (SAVING) or wealth (WEALTH), providing them with an additional income stream from financial returns.[23] If, through the portfolio allocation, the increased wealth is reinvested in financial instruments with lucrative returns, the financial assets and earnings of rich households increase yet again. In this way the magnitude of the growth-inequality nexus is amplified through this feedback cycle.[24]

The above framework clearly shows that in addition to standard factors like technology, globalization, education, and domestic institutions, rising inequality can be exacerbated by the non-inclusive nature of financial sector growth.

9.4.2 Model Verification

To verify the model framework, I use a financial general equilibrium model (FCGE) for one emerging Asian economy, Indonesia.[25] The model is the evolution of FCGE developed by the author since late 1990s (Azis 1997), subsequently applied to the dynamics of manufacturing sector in Azis (2000), and for impact analysis of financial crisis on socio-economic conditions in Azis (2003). With improved monetary block, the model was used to explain the disconnect between financial and real sector in Azis (2004). In Azis (2008) the author used the model to analyze debt sustainability by specifying debt maturity and debt re-profiling. More detailed household income distribution and poverty module were added in Azis (2009). Most parameters are calibrated on the actual data using the (non-linear) model specifications, while others are econometrically estimated. The validity and the predictive power of the model are tested by plotting actual data on some exogenous variables.

The model version used in the current study is based on the most recent available Financial Social Accounting Matrix (FSAM) and a more detailed specification of capital flows. It incorporates a credit channel component that includes the financial structure of lenders and borrowers in determining bank willingness to lend, and the amplified effect due to currency appreciation. The channel connecting financial

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[23] Changes in the exchange rate also cause some valuation effects: the local currency value of any assets denominated in foreign currencies will increase (decrease) when local currency appreciates (depreciates).

[24] Aside from income inequality, poverty and unemployment (UEMPR) are two other social indicators endogenously determined in the model. While unemployment is derived from the difference between labor demand (L) and fixed labor supply, the aggregate variables in the real sector (X, D, E, M, and Q) are all determined along with their respective prices (PX, PD, PE, PM, and PQ). It is PQ that sets the overall price index (PINDEX). The poverty line (PL) can be derived from this. When PL is matched with the endogenously determined household income, the poverty level can be estimated.

[25] Indonesia is selected because like most emerging markets, its financial sector has been growing rapidly since financial liberalization began in the 1980s, and income inequality has worsened. Indonesia also became a primary destination for capital flows once advanced economies set ultra-easy monetary policy.

flows and income distribution is specified in detail by dissecting the flows as they appear on agents' balance sheets based on the type of income generated. Scrutinizing the role and detailed transmission within the financial sector allows us to analyze the dynamics of income earned from returns on financial assets held mostly by urban-based rich households.[26]

Given the shock from increased bank-led flows, two scenarios are constructed: one where recipient banks increase risk by investing in financial assets, particularly securities and equity markets; and the other where recipient banks spend the additional funds more prudently, by using them to strengthen credit and safe assets. In the first scenario (Figs. 9.8a, b, c), real GDP is only slightly higher than the baseline. So are investment and consumption. Inflation and unemployment rates are lower. However, the trade sector suffers: exports decrease and imports increase due to currency appreciation. Looking more closely, appreciation derives from higher interest rates, their level influenced by returns on financial assets. Because the issuance of financial assets increases under this scenario, prices will fall and yields rise, with interest rates also increasing. In the search for higher returns and yields, banks actively invest in these new assets instead of issuing more credit. This explains why the economy grows only slightly.

The effect on income distribution is far more obvious: it gets worse. Whether measured by disparity between rich and poor, or in terms of the rural/urban gap, inequality grows (Fig. 9.9a, b). Although the poverty line drops 1.2 % below the baseline, incomes for all household categories fall, despite growing GDP. Two factors are behind this: (1) wages fall due to lower prices, and (2) economic growth is mostly driven by expanding financial sector-related activity. These tend to benefit only urban-rich households whose depend far less on wages (factor income) than the rural-based poor. With more access to financial markets, the urban-rich accrue extra income from returns on the financial assets they hold. This is why increased bank-led flows under the risky behavior scenario worsen income inequality. And as expected, the largest deterioration is in financial income.

How does this compared with a scenario of prudent bank behavior? While real GDP in both cases is higher than the baseline, the increase is larger when banks act more prudently. There is higher growth in investment and consumption due to lower interest rates, and higher exports due to nominal and real exchange rate depreciation (see Fig. 9.8a, b). Unemployment rate is also much lower, though the price index is higher (see Fig. 9.8c). Thus, the macroeconomic impact is better when banks behave prudently.

Unlike the previous case, income in all household categories increases. More importantly, all factor incomes are higher. As increased liquidity from bank-led flows is not spent on financial assets, the urban rich do not receive extra income

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[26] The model version used in the analysis here follows Min (2014). Due to space constraint, the detailed explanations of the model and simulation results are not shown here (they are available upon request).
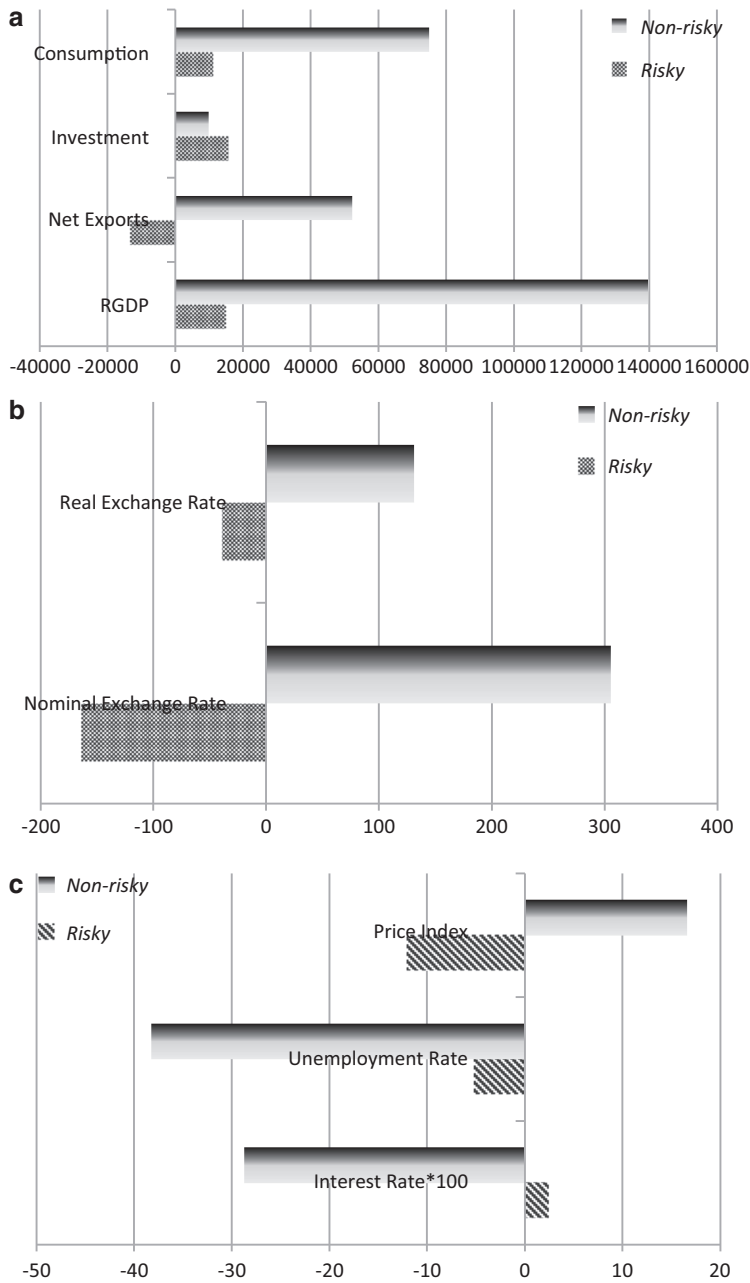
Fig. 9.8 (**a**) Aggregate impact of increased bank-led flows. *Source*: Results of model simulations. (**b**) Impact of increased bank-led flows on the exchange rate. *Source*: Results of model simulations. (**c**) Impact of increased bank-led flows on prices, interest rates, and unemployment rate. *Source*: Results of model simulations
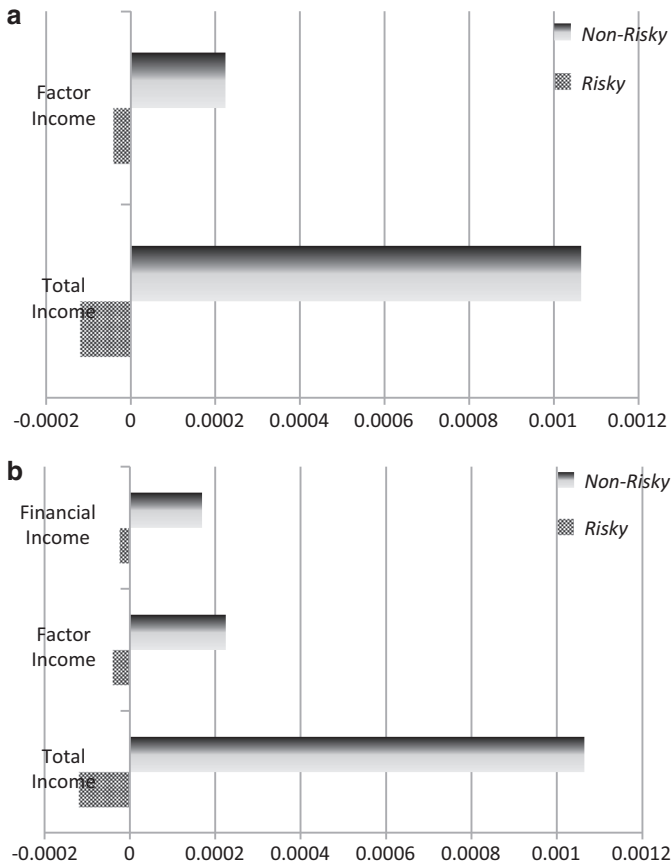
Fig. 9.9 (**a**) Impact of increased bank-led flows on poor/rich income rati. *Source*: Results of model simulations. (**b**) Impact of Increased Bank-Led Flows on Rural/Urban Income Ratio. *Source*: Results of model simulations

from these assets. As a result, overall income inequality between rich and poor, and between rural and urban households, narrows (see Fig. 9.9a, b).

It is abundantly clear that the repercussions of increased bank-led flows depend on how banks react. It is much better when banks act prudently and do not take on increased risk. The problem is, there is no guarantee banks will behave that way. Given the high frequency of financial crises worldwide, especially since the 1990s, it implies that most financial institutions on the receiving end of capital inflows tend to take on more risk. This all suggests policies need to adjust.

9.4.3 What's Next

Despite the risks and potential damage capital flows can cause, no country can stop them—especially when the spread of returns (interest rates) is large and push

factors (slow growth in advanced economies) are substantial. What most countries can do and have done is to refocus their policy on the asset and liability side of bank balance sheet.[27] When external shocks strike, as in the case of European bank deleveraging during the Eurozone crisis, bank credit flows can be disrupted. Theoretically, outflows can be matched by retrenchment—returning foreign assets owned by domestic investors. The size of these assets, however, can only rise if capital outflows are encouraged. On the preventive side, some sort of capital controls can also help—in the form of direct quantitative controls such as imposing a levy on bank-led flows. In the context of regional integration and cooperation, the risk of integration-led contagion can be mitigated by complementing domestic financial safety nets with collective safety nets regionally.[28] The question is, which policy works best?

Three policy options are considered: (1) promote direct investment abroad, labeled "Encourage Outflows" (Fig. 9.10); (2) "Assign Levy" to non-core bank liabilities; and (3) strengthen regional financial safety nets, "Reg Safety Nets." The logic of regional financial safety nets is to support domestic safety nets, as these are far too inadequate given the potential damage caused by the unprecedented size and volatility of capital flows. The rationale for assigning a levy is to restrain rather than stop capital flows. Encouraging capital outflows helps maintain stability of net flows. In times of crisis, when capital tends to flow out during the boom-and-bust cycle, assets held abroad by domestic investors can act as a safeguard. They can provide a foreign asset buffer when markets become volatile. Indeed, the size of these ready-to-use foreign assets was important in some emerging market economies during the global financial crisis; the Republic of Korea is one example (Jain-Chandra et al. 2013).

I use the Analytic Network Process (ANP) to structure the model and quantify the weight of each model element [see Saaty and Vargas (2005)] for a detailed explanation about ANP). Achieving a balanced outcome of MACRO STABILITY, FINANCIAL STABILITY and improved SOCIAL ISSUES, depicted at the top of Fig. 9.10, is the strategic comparative goal. Each policy is weighted in terms of its relevance and contribution to BENEFIT, OPPORTUNITY, COST, and RISK (BOCR) that can be generated by increased bank-led flows. In the BENEFIT cluster, two sets of components are considered: (1) strengthen LIQUIDITY (the first box on the left of Fig. 9.10), through enhanced short-term securities and equity markets, along with boosted financial income; and (2) allow investment, consumption, financial income, and imported intermediate inputs to EXPAND (the second box on the left of Fig. 9.10). Some beneficial impacts of increased bank-led flows, such as improved CAPITAL MARKET, and enhanced RESILIENCE may emerge

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[27] On the asset side, other than reducing loan-to-value ratio, efforts to contain excessive credit expansion and other risky investments are also made. On the liability side, mitigating the increase of non-core liabilities through bank-led flows is critical because they can heighten risky bank behavior and increase leverage. See Azis and Shin (2013) and Forbes and Warnock (2012).

[28] For the status of Asia's regional financial safety nets, see Azis (2012).
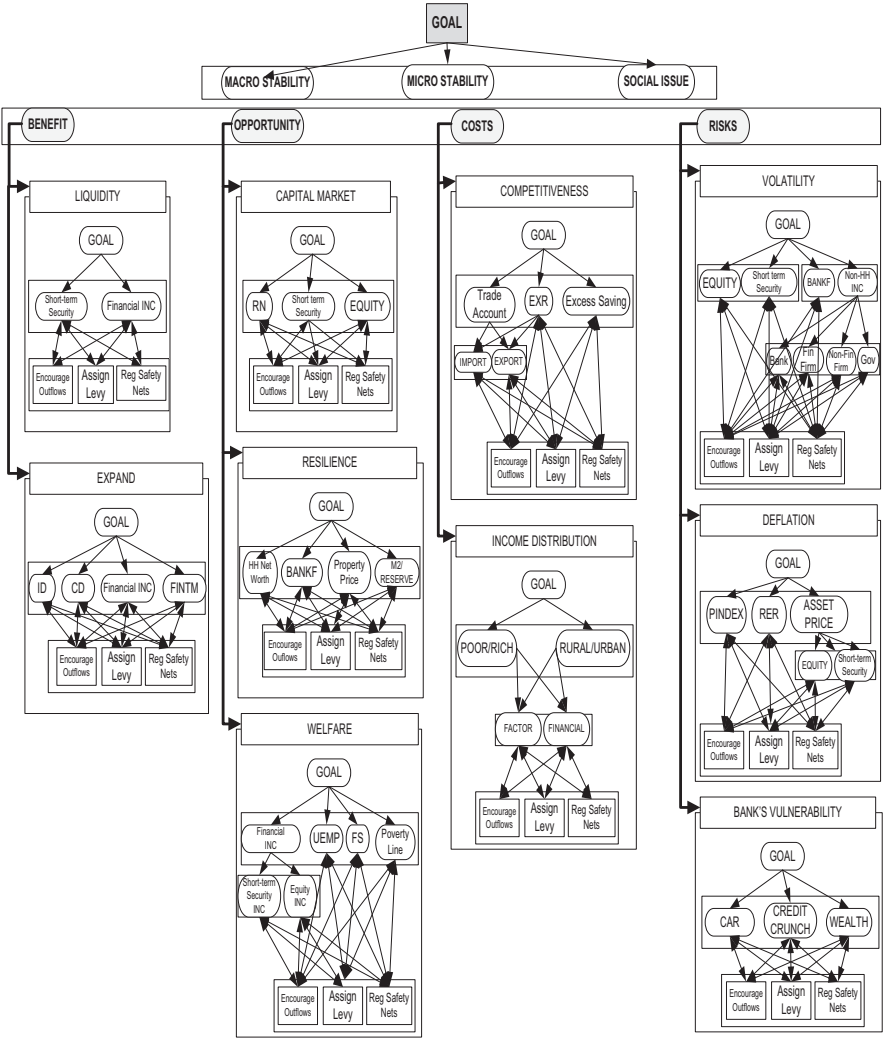
Fig. 9.10 Analytic network process (ANP) structure for policy options

only in the long-run. Recipient countries can also improve overall WELFARE, after a certain period, if they take advantage of the increased capital inflows. All these long-term benefits are grouped in the OPPORTUNITY cluster. The components connecting the GOAL and policies in Fig. 9.10 are most relevant and should be considered in prioritizing policies. For example, given an increase in bank-led flows, improvements in WELFARE can be fueled by a gradual increase in the financial income originating in short-term securities and equity earnings.

On the downside of bank-led flows, the short- and long-term costs (COST and RISK, respectively) are analyzed similarly, except that the priority ranking is based

on the question: "which policy is the most costly or risky" when the following components are considered: COMPETITIVENESS and INCOME DISTRIBUTION under the COST cluster, and VOLATILITY, DEFLATION, and BANK VULNERABILITY under the RISK cluster. It is important to note that the reference for analyzing RISK is capital flow reversal—as in many crisis episodes with a boom-and-bust cycle, the biggest risk in massive capital inflows is precisely their reversal (procyclicality). However, one needs to distinguish this reversal from outflows by domestic investors. While useful in times of crisis, which is why one policy option is to encourage them, a flow reversal from investors pulling out will generate detrimental capital "flight" (see again the distinction between capital "flight" and "retrenchment" discussed earlier).

The policies at the bottom of the network in Fig. 9.10 are weighted with respect to each component and sub-component listed above them. For example, under BANK VULNERABILITY in the RISK cluster, where bank capital may deteriorate during a flow reversal, there is a risk that a bank's capital adequacy ratio (CAR) will deteriorate. The relevant question then is: Which of the three policies will likely create such a risk (most risky)?

All arrows under each component in Fig. 9.10 point in two directions, implying a feedback effect for every influence from an element to the other elements below it. Thus, the structure in each box under each cluster forms a network. Again, taking the example of BANK VULNERABILITY in the RISK cluster, a typical question to ask is: "Given a selected policy, which risk is least likely to be resolved by that policy?" Applying pairwise-comparisons, priority rankings for each feedback was made. The inputs used are a combination of the normalized quantitative data derived from the FCGE model simulations and analytical perceptions. The rankings based on the complex network structure are derived from the limiting super-matrix (see Appendix).

Table 9.1 shows the results of priority rankings for the three policies under the BOCR.[29] Thus, while to "Encourage Outflows" ranks highest in terms of its capacity to generate BENEFIT and OPPORTUNITY, the policy is also considered most costly and risky. For example, compared with "Assign Levy" and "Reg Safety Nets," "Encourage Outflows" will do the least in avoiding decreased competitiveness caused by the appreciation of real exchange rate (RER). On the RISK side, capital flow reversals may cause VOLATILITY in the EQUITY market. To "Encourage Outflows" will obviously make things worse.

Having calculated the above priorities, the next step is to apply them to some BOCR formula. Two types are used here: (1) the multiplicative approach (B × O)/

[29] For example, under the BENEFIT scenario in Table 9.1, three eigen-vectors are shown ("Ideals," "Normals," and "Raw"). While all three give the same ranking, i.e., encourage outflows being most preferred, followed by assigning levies, and regional financial safety nets (hence the ranking shown in the last column of Table 9.1), the normalized eigen-vector (0.4381; 0.4358; and 0.1261) under "Normal" with the sum equals unity is the most often used. All numbers under the column "Benefit," "Opportunity," "Cost," and "Risk" in Table 9.2 show the normalized eigen-vector.

Table 9.1 ANP results for benefit (B), opportunity (O), cost (C), and risk (R)

	Ideals	Normals	Raw	Ranking
Benefit				
1. Encourage Outflows	1	0.438129	0.858812	1
2. Assigning Levies	0.994591	0.435759	0.854167	2
3. Reg Safety Nets	0.287844	0.126113	0.247204	3
Opportunity				
1. Encourage Outflows	1	0.477338	0.826065	1
2. Assigning Levies	0.712725	0.340211	0.588757	2
3. Reg Safety Nets	0.382225	0.182451	0.315742	3
Cost				
1. Encourage Outflows	1	0.725513	1	1
2. Assigning Levies	0.08878	0.064411	0.08878	3
3. Reg Safety Nets	0.289555	0.210076	0.289555	2
Risk				
1. Encourage Outflows	1	0.488161	0.983803	1
2. Assigning Levies	0.313358	0.152969	0.308283	3
3. Reg Safety Nets	0.735147	0.35887	0.72324	2

Source: Results of ANP

(C × R) and (2) the additive approach (bB + oO-cC-rR); for the rationale of both, see Saaty and Vargas (2006).

Table 9.2 lists the results. The upper panel equally ranks BOCR, with the last column shows the superiority of "Assign Levy." The middle and lower panels display the results of sensitivity analyses; the middle reflects a more subdued option, where COST and RISK clusters are weighted more than BENEFIT and OPPORTUNITY, with the reverse case shown in the bottom panel, representing a 'buoyant' scenario. In either case, the highest preference for "Assign Levy" remains. Only the ranking of the other two policies is reversed when an additive approach is used. This suggests the superiority of placing a levy on bank-led flows is robust [see also Azis and Shin (2013)].

9.5 Summary

The global financial crisis and the eurozone crisis made many analysts question the virtue of financial liberalization and integration. These qualms coincide with dramatic changes in the global economy and economic thinking, particularly about the role of capital flows. Adding to the mix is growing income inequality in developed and developing countries alike. For a region where integration has been intensifying, where massive capital inflows came in response to easy money and low interest rates in advanced economies, and where income disparity is rising despite rapid recovery and strong growth, Asia is studied by taking a more balanced view of integration.

Table 9.2 Overall results based on multiplicative and additive BOCR

ANP	Benefit	Opportunity	Cost	Risk	$(B \times O)/(C \times R)$	Ranking	$bB + oO - cC - rR$	Ranking
	b = 0.25	**o = 0.25**	**c = 0.25**	**r = 0.25**				
Encourage outflows	0.438129	0.477338	0.725513	0.488161	0.590499767		−0.07455	3
Assign levy	0.435759	0.340211	0.064411	0.152969	15.04635304		0.1396	1
Reg safety nets	0.126113	0.182451	0.210076	0.35887	0.305205609		−0.0651	2
	b = 0.25	**o = 0.1**	**c = 0.35**	**r = 0.3**				
Encourage outflows	0.438129	0.477338	0.725513	0.488161	0.590499767		−0.2431	3
Assign levy	0.435759	0.340211	0.064411	0.152969	15.04635304		0.0745	1
Reg safety nets	0.126113	0.182451	0.210076	0.35887	0.305205609		−0.13141	2
	b = 0.35	**o = 0.3**	**c = 0.25**	**r = 0.1**				
Encourage outflows	0.438129	0.477338	0.725513	0.488161	0.590499767	3	0.06635	2
Assign levy	0.435759	0.340211	0.064411	0.152969	15.04635304	1	0.22318	1
Reg safety nets	0.126113	0.182451	0.210076	0.35887	0.305205609	2	0.010469	3

Source: Results of BOCR, based on ANP

Unlike in Europe, the process of integration in Asia is more market-driven, institution-light and bottom-up. Given the region's huge diversity of development level, the essence of Asian integration is to manage the diversity, not to seek for a "United Asia". To the extent greater integration poses risks—including financial contagion—both benefits and costs should be gauged carefully. The ultimate goal remains improved welfare. The market-driven process of integration needs to be carefully managed to reap its benefits while minimizing potential costs. It is argued that better and effective regional cooperation can indeed better manage integration and its potential risks. Strengthening financial safety nets is one important example of regional cooperation, given the uncertainty and volatility in financial markets.

On the seeming disconnect between financial sector growth and income inequality, I delve into the interconnections between financial and real sectors by simulating a general equilibrium model with financial module under a scenario of increased bank-led flows as experienced by many emerging market economies. When a large portion of the enhanced liquidity caused by capital inflows is invested by banks in financial assets and other risky loans, the impact on overall welfare is unfavourable. In particular, household income falls, most dramatically on the rural-poor. The only rising income derives from returns on financial assets, which is why the income gap between the rich and the poor widens, and the disparity between rural and urban households worsens. As investing in financial assets—as opposed to lending to firms—has a lower employment-generating capacity, the drop in unemployment is smaller than when banks act prudently. Indeed, prudent behavior is better from both macro-financial stability and income distribution perspectives.

The policy analysis suggests that during the tranquil period capital outflows should be encouraged to help stabilize net flows in times of market turmoil, at the same time strengthening competitiveness as the exchange rate weakens. But after taking into account the costs and the risks of such measure, imposing levy on bank-led flows is preferable. The resulting stable financial market feeds into the real economy, boosting factor income rather than returns on financial assets, suggesting that it will also reduce inequality. Through some sensitivity tests, the result is found to be robust. Clearly, taking one-sided approach in evaluating policy alternatives by neglecting the potential costs and risks of the policies may produce a sub-optimal result.

Appendix

The presence of feedback influences in a network model requires a large matrix—known as supermatrix—that contains a set of sub-matrixes. The supermatrix captures the influence of elements in a network on other elements in that network. Denoting a cluster by C_h, $h = 1, \ldots \ldots m$, and assuming that it has n_h elements $e_{h1}, e_{h2}, e_{h3} \ldots \ldots, e_{hmh}$, and laying out all the clusters and all the elements in each cluster both vertically on the left and horizontally at the top, we have the following supermatrix:

Supermatrix of a Network

$$
W = \begin{array}{c} \\ C_1 \\ \\ \\ C_2 \\ \\ \\ \\ C_N \end{array}
\begin{array}{c} e_{11} \\ e_{12} \\ \vdots \\ e_{1n_1} \\ e_{21} \\ e_{22} \\ \vdots \\ e_{2n_2} \\ e_{N1} \\ e_{N2} \\ \vdots \\ e_{NuN} \end{array}
\begin{array}{ccccc}
\overset{\displaystyle C_1}{\overbrace{e_{11}e_{12}\cdots e_{1n_1}}} & \overset{\displaystyle C_2}{\overbrace{e_{21}e_{22}\cdots e_{2n_2}}} & \bullet\bullet\bullet & \overset{\displaystyle C_N}{\overbrace{e_{N1}e_{N2}\cdots e_{Nn_N}}} \\
\left[\begin{array}{cccc} W_{11} & W_{12} & \bullet\bullet\bullet & W_{1N} \\ W_{21} & W_{22} & \bullet\bullet\bullet & W_{2N} \\ \vdots & \vdots & \bullet\bullet\bullet & \vdots \\ W_{N1} & W_{N2} & \bullet\bullet\bullet & W_{NN} \end{array}\right]
\end{array}
$$

The typical entry of this supermatrix is

Entries in Supermatrix of a Network

$$
W_{ij} = \begin{bmatrix}
W_{i1}^{(j_1)} & W_{i1}^{(j_2)} & \bullet\bullet\bullet & W_{i1}^{(jn_j)} \\
W_{i2}^{(j_1)} & W_{i2}^{(j_2)} & \bullet\bullet\bullet & W_{i1}^{(jn_j)} \\
\bullet & \bullet & & \bullet \\
\bullet & \bullet & & \bullet \\
\bullet & \bullet & & \bullet \\
W_{in_i}^{(j_1)} & W_{in_i}^{(j_2)} & \bullet\bullet\bullet & W_{in_i}^{(jn_j)}
\end{bmatrix}
$$

The entries of sub-matrixes in W_{ij} are the ratio scales derived from paired comparisons performed on the elements within the clusters themselves according to their influence on each element in another cluster (outer dependence) or elements in their own cluster (inner dependence). Judgments are elicited from which ratio scales are derived. The resulting unweighted supermatrix is then transformed into a matrix where each column sums to unity to generate a stochastic supermatrix. The derived weights are used to weight the elements of the corresponding column blocks (cluster) of the supermatrix, resulting in a weighted supermatrix which is also stochastic. The final ranking is derived from the limiting supermatrix, obtained by raising the stochastic supermatrix to large powers to read off final priorities, in which all matrix columns are identical. Each gives the relative priorities of the

elements from which the priorities of the elements in each cluster are normalized to one (the powers of the supermatrix do not converge unless it is stochastic, ensuring that its largest eigenvalue is one). Using the example of the EXPAND component under the BENEFIT cluster in Fig. 9.10, the resulting limiting supermatrix is

Limiting super matrix

		Alternatives	Goal	EXPAND					
		Encourage Outflows	Assign Levy	Reg Safety Nets	EXPAND	CD	FIN INC	FINTM	ID
Alternatives	Encourage Outflows	0.18477	0.18477	0.18477	0.18477	0.18477	0.18477	0.18477	0.1848
	Assign Levy	0.23605	0.23605	0.23605	0.23605	0.23605	0.23605	0.23605	0.2361
	Reg Safety Nets	0.07918	0.07918	0.07918	0.07918	0.07918	0.07918	0.07918	0.0792
Goal	EXPAND	0	0	0	0	0	0	0	0
EXPAND	CD	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745	0.0745
	FIN INC	0.15758	0.15758	0.15758	0.15758	0.15758	0.15758	0.15758	0.1576
	FINTM	0.13292	0.13292	0.13292	0.13292	0.13292	0.13292	0.13292	0.1329
	ID	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135

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