Indicators for economic power and dependence

Simon Fink, Daniel Rempe and Axel Obermeier

Abstract

A fundamental theoretical intuition of international relations is that economic interdependence may be asymmetrical, and hence create relations of power and dependence. This intuition is implicit in many discussions in IR. However, empirically, power of states is mostly measured using attributional data (e.g. GDP or military expenditure) that only represent properties of single countries, but not their interdependence. This research note proposes relational dependence/power indicators that are based on trade flows. The indicators measure the extent to which trade relations are asymmetric, and hence confer power to one of the partners. Moreover, the logic behind these indicators fits to other economic data (e.g. FDI or ODA) as well. An empirical study of Brazil’s economic power illustrates the usefulness, interpretation and properties of the new indicators.

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**Introduction**

A fundamental theoretical intuition of international relations is that economic interdependence may be asymmetrical, and hence creates power and dependence (Keohane and Nye 1977: 15). In an exchange relation, the partner that is less dependent on the exchange is the more powerful actor. Vice versa, the partner that is dependent on the exchange relation is in a weaker position (Keohane and Nye 1977, Keohane and Nye 1987).

This fundamental theoretical intuition is implicit in many discussions in IR. The term interdependence has been substituted by the term globalization (Zürn 2002). However, the idea of interdependence and asymmetrical power relations informs regime theory (Zürn 1993, Hasenclever et al. 1997), theories of European integration use bargaining power to explain integration outcomes (Moravesik 1998), and research on foreign and security policy also stresses the role of asymmetrical interdependence (Papayoanou 1999). Put in a broader theoretical context, the idea of increasing – and possibly asymmetric – interdependence lies at the heart of most globalization theories (Ohmae 1995, Guillén 2001, Keohane and Nye 2001: Ch.10).

However, economic power and dependence are mostly measured with monadic data, the unit of analysis is the state. GDP, GDP growth, or military expenditures figure prominently among the indices of power (see, e.g. Mattli (1999: 82, Brooks and Wohlforth 2008)). These indicators reflect a facet of power, but they do not adequately reflect the concept of interdependence. Interdependence – and hence, power – is not the attribute of a single country, but emerges from and expresses relations between countries (Hafner-Burton et al. 2009, Hafner-Burton and Montgomery 2009: 29) – an idea also prevalent in neorealism (Waltz 1979: 98)

This research note proposes new indicators for economic power and dependence, based on the economic relations between countries. Here, we focus on trade relations. Yet, the logic
is transferable to other economic realms like investment or development aid as well. Starting point for the indicators is an analogy between firms and states. Power relations ensue when a state is less dependent on a trade relation than its “suppliers”. Similarly, power relations ensue when a state is less dependent on a trade relation than its “customers”. Thus, we may speak of export dependence and import dependence that arise because trade relations are valued differently by the two partners in an exchange.

Based on the theoretical notion that two trade partners may value a trade relation very differently, the research note develops several indicators for power and dependence. The indicators are all based on trade flows and their importance for the exporter and the importer. They differ in whether they assess imports, exports, or both trade flows, and whether they take into account the overall importance of the trade relation.

The usefulness and interpretation of the indicators are illustrated using the example of Brazil’s role as an emerging power in the world economy (Schirm 2010). The illustration cannot be a conclusive test, but intends to illustrate the application and interpretation of the indicators. However, we can tentatively conclude that Brazil’s changing role in world politics is not only due to its attributes (e.g. population, GDP, military expenditure), but also due to its changing relation to its trade partners. Brazil is getting less dependent from trade partners, but the trade partners grow more dependent on Brazil’s goods and Brazil’s market.

The paper is structured as follows. The second part discusses the theoretical idea underlying the indicators. The third part describes the construction of the indicators. The fourth part illustrates the use of the indicators. Part five concludes.

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2 A longer version of the analysis can be found in Dinkel and Fink (2010).
**Underlying theoretical idea**

Dependence and power are two faces of the same coin. State A potentially has power over state B if state B is dependent on state A. Conversely, state A is less powerful if it is dependent on others: „When we say that asymmetrical interdependence can be a source of power we are thinking of power as control over resources, or the potential to affect outcomes. A less dependent actor in a relationship often has a significant political resource, because changes in the relationship [...] will be less costly to the actor than to its partners.” (Keohane and Nye 1977: 10, Keohane and Nye 1987) However, the relation between asymmetrical interdependence and power is not straightforward. Asymmetrical interdependence does not automatically translate into power (Baldwin 1979, Baldwin 1980, Wagner 1988), but asymmetrical interdependence offers the potential to wield power.

We may illustrate this idea using the analogy of a firm (Williamson 1975, Waltz 1979: 98, Pfeffer and Salancik 2003). A firm that produces intermediary goods in a production chain has suppliers and business customers. Similarly, a state has partners from whom it imports goods, and partners to whom it exports its goods. The relation to these “suppliers” and “customers” may be described as in Figure 1.
1) From the perspective of state A, it is desirable that its exports account for a large share of state B’s imports. In this way, A can put pressure on B by threatening to withhold supply.

2) Conversely, it is desirable for A that it diversifies its exports. In this way, A is not dependent on B’s markets alone. If B would be A’s only customer, B could put pressure on A.

3) From the perspective of state A, it is desirable that its imports from B only account for a small proportion of all its imports. Otherwise, B could pressure A by threatening to cut off supply.

4) From the perspective of state A, it is desirable that the exports from B to A account for a large proportion of B’s exports. In this way, A can threaten to close its market to B.
In the center of Figure 1 is the target state, for which economic power or dependence are assessed. The power/dependence of the target state can be divided into two elements. First, its dependence on its export partners (the countries that receive products from state A) and second, its dependence on its import partners (the countries that deliver goods to state A).

The upper half of Figure 1 shows the first half of the dependence logic, the export logic. Viewed from the perspective of state A, it is beneficial if its exports account for a large proportion of its partner’s imports. According to the firm analogy: Viewed in terms of power, it is desirable for a firm that its customers depend to a large extent on its supplies. In this way, the firm can put pressure on its customers. If, e.g., a supplier of car motor parts A accounts for 90% of the motor parts used by a car company B, then this supplier A is potentially powerful, because it may be costly for the car company B to lose its supplier A (Pfeffer and Salancik 2003). Additionally, a second consideration applies. From the perspective of the supplier A, it would be desirable that its own customer portfolio is diversified. It should not be overly dependent on one customer (Venkataraman et al. 1990). If the supplier of car motor parts A not only accounts for 90% of the motor parts used by car company B, but these motor parts account for 90% of its own production, then the power relation is nearly equal. Both companies depend to the same extent on the trade relation (Nootboom et al. 2000). The same considerations apply for trade relations between states: „Interdependence interests international theorists primarily because of its relationship to power. If A and B are mutually dependent on one another, then each could inflict costs on the other by severing the relationship. And the ability to inflict costs on other actors is one measure of influence.“ (Baldwin 1979: 177) Thus, the first indicator for dependence/power in a dyadic relation between state A and state B is: What is the relation between the importance of A’s exports to B for A on the one hand, and the importance of A’s exports to B for B on the other hand? Put
in the terms of Figure 1: What is the relation between the yellow/vertically striped portion of
country A’s exports and the yellow/vertically striped portion of country B’s imports?

The bottom half of Figure 1 shows the second half of the dependence logic, the *import logic*. Viewed from the perspective of state A it would be desirable if its imports account for a
large proportion of B’s exports. In this way, a large part of B’s economy would depend on A’s
markets. On the other hand, it is desirable for A if its own imports stem from many different
partners. In this way, no single supplier is able to blackmail A. The car parts supplier analogy
also holds. Car motor parts supplier A itself buys raw material from company C. In this case,
it is desirable for the supplier A that its raw materials supplier C is dependent on A buying a
large share of its raw material. On the other hand, A does not want to be overly dependent on
C, but would prefer to buy its raw material from several sources. Thus, according to the
import logic, the second indicator for dependence/power in a dyadic relation between state A
and state B is: *What is the relation between the importance of B’s exports to A for A on the
one hand and the importance of B’s exports to A for B on the other hand?* In terms of Figure
1: What is the relation between the red/horizontally striped portion of country A’s imports and
the red/horizontally striped portion of country B’s exports?

If we have reasons to suspect that either export or import dependence are substantially
more important, then we may continue with either of these concepts. This would imply that
either the option to withhold goods or the option to close one’s own market is the more
important facet of power.

However, it seems theoretically appropriate to combine both logics, and to recognize
that states are in dyadic interdependence relations, in which they are both exporters and
importers for each other, and that export as well as import relations are important (Baldwin et
al. 1997: 131). Theoretically, it is possible that two states are in reciprocal dependence
relations. For example, state A is not dependent on exports to state B (state A is more
powerful in this regard), but state A is dependent on imports from state B (state B is more powerful in this regard). Figure 2 illustrates this intuition: State A could threaten state B to reduce its exports to B, as B is dependent on goods from A. However, A is dependent on imports from B, and in the aggregate of both forms of dependence, an equilibrium emerges in which no state is more powerful than the other.\(^3\) Thus, we have good reasons to combine information about export and import dependence. Based on these theoretical considerations, the following section derives indicators for state’s power/dependence in their trade relations.\(^4\)

Figure 2: Reciprocal dependence relations

![Figure 2: Reciprocal dependence relations](image)

**Development of indicators**

Following the theoretical logic outlined in the preceding section, this section develops indicators of economic power based on a dyadic relation state A – state B.\(^5\)

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\(^3\) This example is no mere artificial construction. The data reveal several country dyads that exhibit a similar pattern. In the year 2000, exports from Iraq to Ecuador accounted for only 0.004% of Iraq’s total exports, but for 0.01% of Ecuador’s imports. Conversely, the exports from Ecuador to Iraq accounted for only 0.02% of Ecuador’s total exports, but for 0.15% of Iraq’s imports. Thus, Iraq was powerful towards Ecuador in its export relation, but dependent in its import relation. In the aggregate, the relations balance.

\(^4\) This concept of power resembles network concepts of power (Bonacich 1987, Jansen 2003, Wasserman and Faust 2007).

\(^5\) The following considerations neglect formal notation and focus on an easily accessible derivation of the indicators.
The first indicator – the *export dependence score* – assesses the export dependence from the perspective of state A. What is the relation between the importance of A’s exports to B for A on the one hand, and the importance of A’s exports to B for B on the other hand? This dependence may be expressed as the relation between the proportion of the exports from A to B on A’s total exports and the proportion of the exports from A to B on B’s total imports.

$$\text{export dependence}_{A,B} = \frac{\text{exports}_{A\rightarrow B}}{\sum \text{exports}_A} \div \frac{\text{exports}_{A\rightarrow B}}{\sum \text{imports}_B}$$

For example, we might imagine that the exports from the US to Angola only account for 1% of total exports of US, but that the same trade flow accounts for 10% of Angola’s total imports. Thus, the value of the export dependence score for the US in relation to Angola is 1/10.

In this raw form, the range of the indicator is as follows:

<table>
<thead>
<tr>
<th>Values</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>For state A, the trade flow is less important than for state B ~ state A is more powerful/less dependent than state B.</td>
</tr>
<tr>
<td>1</td>
<td>The importance of the trade flow is equal for both partners.</td>
</tr>
<tr>
<td>&gt;1</td>
<td>For state B, the trade flow is less important than for state A ~ state A is less powerful/more dependent than state B.</td>
</tr>
</tbody>
</table>

This range has some properties that are not desirable for applied research. The major problem is the lack of symmetry. It would be desirable for the values of the indicator to be symmetric around the point where the two partners are equally powerful. For example, in this raw form, the indicator equals 0.1 if the trade proportions are 1% (state A) and 10% (state B), while it equals 10 if the proportions are 10%/1% (the inverse situation). This renders interpretation of the indicator cumbersome.
Thus, we transform the indicator. If the value of the indicator is between 0 and 1, we take the reciprocal value and multiply with -1.

\[ export \ dependence_{A,B} = -1 \times \frac{1}{\text{export dependence}} \mid 0 < \text{export dependence} < 1 \]

Now, the range is symmetrical.

<table>
<thead>
<tr>
<th>Values</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;-1</td>
<td>For state A, the trade flow is less important than for state B ~ state A is more powerful/less dependent than state B.</td>
</tr>
<tr>
<td>1</td>
<td>The importance of the trade flow is equal for both partners.</td>
</tr>
<tr>
<td>&gt;1</td>
<td>For state B, the trade flow is less important than for state A ~ state A is less powerful/more dependent than state B.</td>
</tr>
</tbody>
</table>

For example, we would get the following values:

\[ \frac{30}{5} = 6 \]

\[ \frac{5}{30} = 0,1667 \rightarrow -1 \times \frac{1}{0,1667} = -6 \]

Our indicator is now symmetric. Whether A or B is more powerful in the relation is expressed by the sign of the indicator. If A is less dependent/more powerful, the sign is negative, if A is more dependent/less powerful, the sign is positive. A very simple interpretation of the indicator is that a trade flow is X times more important for one state than for its partner. For example, if the indicator equals 6, this may be interpreted to mean that a trade flow is 6 times more important for A than for B; if the indicator equals -6, this means that a trade flow is 6 times more important for B than for A.

We perform another transformation for the sake of symmetry. If the indicator equals 1 (equality of dependence/power), we substitute 1 with 0. A situation of total balance of dependence/power is thus expressed by a 0.

Thus, the final range of our indicator is:
A further problem concerns the question whether we should weight the indicator. In its current form, it does not distinguish between situations like 6%/3%, 12%/6% or 40%/20%. Due to the construction of our indicator, the power/dependence score in all these situations is 2. If we consider 40%/20% a more important situation than 6%/3%, and presume that the former situation confers more leverage to state B than the latter (a trade flow accounts for 40% of A’s exports, but for 20% of B’s imports), we can weight the dependence indicator.

We could use the mean of both proportions as a weight:

\[
\text{mean weighted export dependence}_{A,B} = \frac{\text{export dependence}_{A,B} \times \left( \frac{\text{exports}_{A \rightarrow B}}{\sum \text{exports}_A} \right) + \left( \frac{\text{exports}_{A \rightarrow B}}{\sum \text{imports}_B} \right)}{2}
\]

If we do this, it would clearly make a difference whether we have a 40%/20% or a 6%/3% situation:

\[
\text{mean weighted export dependence}_{A,B} = \frac{40}{20} \times \frac{40 + 20}{2} = 2 \times 30 = 60
\]

\[
\text{mean weighted export dependence}_{A,B} = \frac{6}{3} \times \frac{6 + 3}{2} = 2 \times 4.5 = 9
\]

If we think that 40%/20% is a considerably different situation from 6%/3%, we may choose to square the mean of both proportions.
The weights considerably extend the range of the indicator, as more important trade relations are weighted more heavily. The three examples below illustrate the behavior of the indicator:

<table>
<thead>
<tr>
<th>Basic relation</th>
<th>Unweighted</th>
<th>Mean weight</th>
<th>Squared weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%/1%</td>
<td>2</td>
<td>2 × 1.5 = 3</td>
<td>2 × 1.5² = 4.5</td>
</tr>
<tr>
<td>4%/2%</td>
<td>2</td>
<td>2 × 3 = 6</td>
<td>2 × 3² = 18</td>
</tr>
<tr>
<td>40%/20%</td>
<td>2</td>
<td>2 × 30 = 60</td>
<td>2 × 30² = 1800</td>
</tr>
</tbody>
</table>

Thus, we have defined three different indicators.

1. export dependence\(A,B\)

2. mean weighted export dependence\(A,B\)

3. squared weighted export dependence\(A,B\)

These indicators reflect state A’s dependence on its exports to state B, and hence the upper half of the logic illustrated in Figure 1. The intuition underlying this indicator is that states are powerful towards countries they can cut off supplies.\(^6\)

The second indicator – the import dependence score – represents the lower half of Figure 1. The indicator reflects the power that builds on the threat of market closure. The essential question is: What is the relation between the importance of B’s exports to A for A on the one hand and the importance of B’s exports to A for B on the other hand? In terms of Figure 1: What is the relation between the red/horizontally striped portion of country A’s imports and the red/horizontally striped portion of country B’s exports? Thus, the indicator

\[
squared \text{ weighted export dependence}_{A,B} = \text{export dependence}_{A,B} \times \left( \frac{\sum \text{exports}_{A \rightarrow B}}{\sum \text{imports}_{B}} + \frac{\sum \text{exports}_{A \rightarrow B}}{\sum \text{imports}_{B}} \right)^2
\]

\(^6\) This could adequately reflect the power of OPEC-countries (Caporaso 1978).
for import dependence may be constructed according to the same basic logic as the indicator for export dependence:

\[ \text{import dependence}_{A,B} = \frac{\sum \text{exports}_{B \rightarrow A}}{\sum \text{exports}_{B}} - \frac{\sum \text{imports}_{A}}{\sum \text{exports}_{B}} \]

We perform the same transformations as with the export dependence indicator, and get a range of:

<table>
<thead>
<tr>
<th>Values</th>
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</tr>
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<tbody>
<tr>
<td>&lt;-1</td>
<td>For state A, the trade flow is less important than for state B ~ state A is more powerful/less dependent than state B.</td>
</tr>
<tr>
<td>0</td>
<td>The importance of the trade flow is equal for both partners.</td>
</tr>
<tr>
<td>&gt;1</td>
<td>For state B, the trade flow is less important than for state A ~ state A is less powerful/more dependent than state B.</td>
</tr>
</tbody>
</table>

Additionally, we may perform the same weighting procedures (mean and squared).

We may now use the separate indicators for export or import dependence if we think that either of the two forms of dependence/power is more important than the other, or we may simply sum them up to derive a measure of “total” dependence/power. Range and interpretation are the same as with the two other indicators.

\[ \text{trade dependence}_{A,B} = \text{export dependence}_{A,B} + \text{import dependence}_{A,B} \]

**Properties and interpretation of the indicators**

The following section illustrates properties and interpretation of the indicators. The example used is Brazil’s role in the world market. Thus, we contribute to the discussion about the role of “emerging powers”, that is, states like Brazil, India, or China that are beginning to
play a more important role in world politics and international organizations (Harris 2005, Macfarlane 2006, Nolte 2006, Schirm 2010). An open question is how to assess the power resources of these emerging powers (Nolte 2006). Often, attributional data like GDP, military expenditure or population growth are used to assess state power. Our indicators allow to assess Brazil’s role in the network of economic relations and its dependence/power positions towards other states.

A first analysis step may for example focus on the relation between Brazil and the US. The argument could be that Brazil’s role as an emerging power is not only due to its economic growth, but also due to its changing trade relation to the US. Figure 3 shows the development of the unweighted dependence indicators over time, divided by import-, export- and overall dependence.

Figure 3: Import and export dependence of Brazil from the US
According to the theoretical considerations, the interpretation of the unweighted
dependence scores is rather straightforward and intuitive. The value of 25 for the overall
dependence score in the year 1962 in Figure 3 means that trade between Brazil and the US
was 25 times more important for Brazil than it was for the US (based on trade proportions).
Thus, we can conclude that the US was more powerful in its trade relation with Brazil in
1962. The overall pattern continues through the years. Brazil is always more dependent on the
US than vice versa (the dependence scores are always > 1). In 1965, dependence of Brazil on
trade with the US had reached a high of about 37. This pattern changed in the following
decade. In 1975, trade between Brazil and the US was only 18 times as important for Brazil as
it was for the US. Brazil was growing more independent from trade with the US. This
changed slowly from 1975 to 1993, with Brazil becoming more dependent on US trade again.
In the mid-1990s, we can see the effects of MERCOSUR – Brazil becoming more
independent from US trade – but the South America crisis at the end of the millennium brings
Brazil again in closer dependence from the US. However, since 2003, Brazil has diversified
its trade and is less and less dependent on trade with the US.

The differentiation of our indicators in export- and import-dependence allows further
conclusions. In 1965, Brazil was dependent on the US as a supplier of goods. The score for
the import dependence is higher than for export dependence. This pattern can again be found
in the end-1980s. During the 1970s and since 1994 we have a different pattern. In these
periods, export dependence is larger than import dependence. Thus, the importance of the US
as a market for Brazilian goods is high.

The application of the indicators is not confined to dyadic analyses. Following the
standard logic of statistical applications, we can calculate means. Thus, we might assess
Brazil’s dependence on its average trade partner.7

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7 The usual caveats concerning the interpretation of means apply. We could as well have calculated the median
value or any other descriptive statistics.
In Figure 4 we display unweighted dependence scores. The figure shows that Brazil has been on average the more powerful partner in its trade relations. However, the extent of trade power has changed considerably over time. A first increase of independence occurred in the 1960s and 1970s. In the mid-1970s, trade with the average partner was 15 times more important for the average partner than for Brazil. In the 1980s, Brazil became more dependent on its trade partners, but since the 1990s, Brazil has become more independent from its trade partners. The figure displays export and import dependence separately; hence, we can make claims about the two “drops” in 1997 and 2000. In both years, Brazil suddenly became less dependent on its average trade partner. The figure shows that this is due to a drop in import dependence, that is, Brazil became less dependent on its suppliers (and Brazil’s suppliers became more dependent on Brazil’s market). A dyadic perspective could elucidate if this development is maybe due to the suddenly changing trade relations to Argentina in the wake of the South American economic crises.
However, the unweighted indicators should be interpreted cautiously. They weight the relations between trade proportions equally, notwithstanding the underlying proportions (2%/1% is the same as 40%/20%). If we assume that 2%/1% implies the same dependence/power potential as 40%/20%, this is appropriate. However, if we think that the 40%/20% relation somehow implies a more important dependence/power relation, then we should use the weighted indicators.

Figure 5: Role of Brazil in world trade – mean weighted dependence indicator

Figure 5 demonstrates some of the properties of the weighted dependence scores. They represent the same trade relations as in Figure 4. However, the importance of the trade relations is now weighted. A simple and predictable result is that the range of the indicator expands. Additionally, in comparison to Figure 4, Brazil is now the more dependent partner in the 1960s. The difference to the non-weighted indicator is due to the fact that Brazil had many

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8 For example: The exports from state A to state B account for 2% of state A’s exports, but only account for 1% of B’s imports vs. the exports from state A to state B account for 40% of state A’s exports, but only account for 20% of B’s imports.
minor trade relations in the 1960s in which they were the more powerful partner (e.g. 1%/2%), and that these relations balanced the major relations in which Brazil was the less powerful partner (e.g. 1%/2% balances 6%/3%). However, if we account for these differences by using weights, we see that Brazil was the less powerful partner in the 1960s. The power in the minor relations does not balance the dependence in the major relations anymore. The weighting of the indicators now precludes any simple interpretations. The claim “the trade relation is X times more important for Brazil than for its partners” is not valid anymore, as the weights are factored in.

As a last illustration of the usefulness of the indicators, we perform a cross-national comparison over time. Any indicator is valid only to the extent that it can reflect differences over time as well as differences between countries. Additionally, by only looking at Brazil, we do not yet have an intuition about which values are empirically frequent.

Figure 6: Role of Brazil in world trade compared to other emerging powers

Source for raw trade data: wits.worldbank.org. Unweighted dependence scores
Figure 6 shows the same data as Figure 4 for Brazil, the unweighted dependence score over time. However, we have now added three other countries considered as emerging powers in the literature (Harris 2005) to the figure. Now, we can see that Brazil has on the average decreased its dependence from its trade partners, as have India and to some extent South Africa – their dependence scores decrease. However, the more powerful role of Brazil or India in the world trade system pales in comparison to the ascent of China. As we depict unweighted dependence scores in Figure 6, the interpretation of the values is straightforward. In the year 2005, for the average trade partner of China the trade relation is 200 times as important as for China. Figure 6 demonstrates that a cross-national comparison must guide the interpretation of any indicator. Brazil may have grown more powerful in its trade relations – but the ascent of China dwarfs Brazil’s increased role.9

The illustrations of the new indicators use presented here are only a first hint at possible uses for applied research. The indicators can be aggregated in various ways to depict relations between country groups (e.g. Brazil – EU, or MERCOSUR – EU). The indicators scale very well, they can represent features of dyadic or interregional relations, or properties of the international system. Last but not least they can be used as dependent or independent variables in regression models (or other statistical models).

The analyses presented here do not allow conclusive inferences about Brazil’s role in the world. They are only intended to illustrate interpretation and usefulness of the indicators. However, we may tentatively conclude that the indicators reflect how Brazil has incrementally increased its power position in the world trade system. Brazil is becoming more and more important, as “supplier” and as “customer” of goods. This perspective can complement the standard indicators focusing on Brazil’s increasing GDP or other attributional data.

9 Just for comparison: In 2008, the world’s five foremost trade powers are (in unweighted terms): USA (-275), Germany (-183), China (-177), Japan (-113), and France (-98). If we take mean weights, the ranking is China, USA, Germany, France, Japan.
Conclusion

The paper argues that the dependence/power of states can be measured in a relational way, focusing on dyadic trade relations. Differences in the importance of trade flows between the exporter and the importer constitute asymmetrical interdependence, and hence a potential source of power and dependence. Based on simple exchange theoretical ideas, the paper proposes several measures that reflect the differences in importance of trade flows for two trade partners. The underlying intuition is that two partners are equal in terms of power if a given trade flow is equally important for both of them. That is, the trade flow is as important for the importer as it is for the exporter, in terms of proportions of total imports or exports.

To the extent that this relation changes, the more dependent one partner becomes, and the more powerful the other partner becomes. In its simplest form, the dependence indicators communicate that a given trade flow is $X$ times more important for a country than for its trade partner. Thus, the new measures – the export and import dependence score – directly reflect asymmetrical interdependence.

Several caveats apply. First, we only can measure potential power. Asymmetrical interdependence constitutes a power resource, or, in neorealist terms a “capability” (Waltz 1979). Whether states can capitalize on this resource depends on other factors (Baldwin 1980, Wagner 1988, Schirm 2010). Second, our indicators only represent economic power. Other sources of power, such as soft power or military power are unaccounted for. Additionally, our indicators only account for one specific facet of economic power, namely, trade power. Capital flows might constitute another source of economic power. However, the basic construction logic of our indicators can also be applied to data on capital flows. Moreover, the use of trade data may be defended with regard to the important role that trade is still thought to play in international (economic) relations (Barbieri 1996, Oneal and Russett 1997, Oneal and Russett 1999). Trade can also be regarded as a good proxy for other types of flows, e.g.
communication and capital flows are highly correlated with trade (Simmons and Elkins 2004). *Third* even in the realm of trade relations, some traded goods might be considered more important than others with regard to power relations. For example, a country may be dependent on its arms or oil trade more than on its trade with furs. However, our indicators can deal with disaggregated trade data or with weights of specific commodities. As with capital or communication, the indicators apply to any kind of dyadic directed flow data. *Fourth*, a further direction of indicator development might take into account the fact that states are to a different degree dependent on trade, that is, some states have a larger national market, others depend on international trade (Krasner 1976, Katzenstein 1985). *Fifth*, a constructivist might hold that dependence is “what states make out of it”, and that raw power resources are subject to different interpretations (Wendt 1992). However, this does fit our proposition that we measure the potential for power, and not its realization in any way.

Nevertheless, we believe that our indicators are an important step forward in assessing power in the international system. The indicators do not claim to represent power in all its facets, but they touch upon an important potential power resource, asymmetrical interdependence in trade relations. The indicators scale very well, are universally applicable, and their basic logic generalizes to any kind of directed dyadic flow data. If we presume that globalization means that interdependence between states increases, then our indicators are useful. And if we presume that interdependence between states does not increase as globalization theorists’ claim, then our indicators are equally useful. In any case, we need good indicators that can represent this development.
Appendix

*** DependenceIndicators.do
*** Generates the Dependence/Power indicators described in
Fink/Rempe/Obermeier 2010
*** simonfink.wordpress.com

*** Basis: a dataset of trade flows that contains the following information
(dataset may be requested at simon.fink@uni-bamberg)

*** exporter – Name of exporter
*** importer – Name of importer
*** tradevalue – trade flow
*** exporter & importer contain the "world" as exporter or importer,
containing the total exports/imports of a country
*** exp_proportion – proportion of trade flow on the exports of the
exporter
*** imp_proportion – proportion of the trade flow on the imports of the
importer
*** perm_dyad_code – permanent code for the dyad A-B (that is, e.g. 1 if
the exporter is Afghanistan and the importer is Bhutan or the exporter
Bhutan and the importer Afghanistan)

*** the do-file might not work with other datasets for numerous reasons
(different variable names). But you get the basic ideas on how variables
are manipulated to generate the indicators

*** some of the variables in the do-file that are for internal purposes
only are still named in German. But the relevant indicators are named in
English.

*** First indicator: export dependence

generate Dependence_exp = exp_proportion/imp_proportion

*** Indicator doesn´t make sense if importer or exporter == world
replace Dependence_exp = . if exporter == "World" | importer == "World"

*** Change of range.
replace Dependence_exp = -1*1/Dependence_exp if Dependence_exp < 1
replace Dependence_exp = 0 if Dependence_exp == 1

*** Weights

generate Dependence_expW = Dependence_exp *
((exp_proportion+imp_proportion)/2)
generate Dependence_expSqW = Dependence_exp *
(((exp_proportion+imp_proportion)^2)/2)

*** Second indicator: import dependence

bysort year perm_dyad_code: generate zaehler = _n if symm == 1

bysort year perm_dyad_code: generate wievielschicktB_ABS = tradevalue[2] if
symm == 1 & zaehler == 1
bysort year perm_dyad_code: replace wievielschicktB_ABS = tradevalue[1] if
symm == 1 & zaehler == 2
bysort year perm_dyad_code: generate wievielschicktB_REL =
exp_proportion[2] if symm == 1 & zaehler == 1
bysort year perm_dyad_code: replace wievielschicktB_REL = exp_proportion[1] if symm == 1 & zahler == 2
bysort year perm_dyad_code: generate wievielkriegtA_GES = total2[2] if symm == 1 & zahler == 1
bysort year perm_dyad_code: replace wievielkriegtA_GES = total2[1] if symm == 1 & zahler == 2
drop zahler
generate AnteilExporteBAanImporteA = wievielschicktB_ABS/wievielkriegtA_GES*100
generate Dependence_imp = AnteilExporteBAanImporteA/wievielschicktB_REL
drop wievielschicktB_ABS wievielkriegtA_GES zahler
AnteilExporteBAanImporteA wievielschicktB_REL
replace Dependence_imp = -1*1/Dependence_imp if Dependence_imp < 1
replace Dependence_imp = 0 if Dependence_imp == 1
generate Dependence_impW = Dependence_imp * 
((exp_proportion+imp_proportion)/(2))
generate Dependence_impSqW = Dependence_imp * 
(((exp_proportion+imp_proportion)^2)/(2))

*** overall dependence scores

generate Dependence_overall = Dependence_exp + Dependence_imp
generate Dependence_overallW = Dependence_expW + Dependence_impW
generate Dependence_overallSqW = Dependence_expSqW + Dependence_impSqW
References


